

BOOKSHELF | By Amir D. Aczel

# An Expedition Without End

## Measure of the Earth

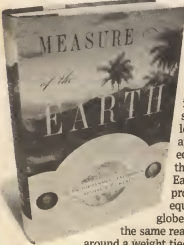
By Larrie D. Ferreiro

(Basic Books, 353 pages, \$28)

The ancient Hebrews needed 40 years to travel from Egypt to the Promised Land. But who would believe that in the 18th century—when trade routes across the Atlantic had been established for two centuries and colonial roads stretched well into the South American continent—a group of scientists traveling from France to the area of present-day Ecuador would require almost 40 years for all the members to complete the trip?

Yet this is what happened to some members of what Larrie D. Ferreiro describes as “the world’s first international scientific expedition.” The group, whose adventures are deftly told in “Measure of the Earth,” left France in 1735 on a mission organized by the French Academy of Sciences. The members of the Geodesic Mission (later joined by Spaniards traveling separately) were charged by Louis XV with bringing back from South America one single number considered so important that France was eager to invest millions of francs to obtain it.

This number was the width of one degree of latitude measured at the equator. It held the key to the puzzle of the shape of our planet, or “the form of the Earth,” as it was called. That form, in turn, was essential to an accurate navigation of the seas, a skill essential to aspiring imperial powers.



Earlier data had implied that the Earth might be shaped like an egg. But Newton’s recently published theory of mechanics indicated that a spinning Earth would look more like an apple, wider at the equator and flatter at the poles. Since the Earth’s rotation is most pronounced at the equator, that part of the globe bulges the most—for

the same reason that if you swing around a weight tied to a rubber band, the band will expand. Thus a degree of latitude there is smaller, in actual north-to-south distance, than a degree closer to one of the poles. (If the Earth were a perfect sphere, a degree of latitude would be everywhere equal.)

To establish this simple fact, however, required taking thousands of painstaking terrestrial and astronomical measurements from a series of sites located directly at the equator. Mr. Ferreiro is at his best describing the actual effort to do so, with its endless adventures and calamities. Having arrived in South America, the scientists started on their way to Quito, which was to be their base of operations. A Spanish member of the expedition described in his journal the challenge of fighting off mosquitoes: “No expedient was of any use against their numbers; the smoke of the trees we burnt all night to disperse them seemed to augment rather than diminish their numbers; our faces were swollen and our bodies ablaze and covered in welts.” Some members contracted malaria. Fortunately, the group was traveling through the very region that is home to the fabled cinchona tree—the “fever tree,” as the natives called it—whose bark is the source of quinine, used as a treatment.

The difficulties were just beginning. The 200-mile arc that the scientists had chosen to survey traveled across a line of volcanoes in the Andes, each of which they had to climb. The men camped for months at an altitude of 15,000 feet, battling subzero temperatures and coping with altitude sickness while waiting for the skies to clear so that they could see the terrain clearly enough to make a single measurement out of the many required.

**Battling subzero temperatures, swarming mosquitoes and angry Inquisitors, all to find a single number.**

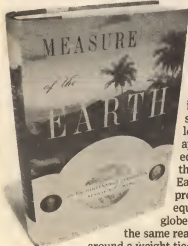
The expedition was beset by money problems, too. Its unscrupulous leader, the astronomer Louis Godin, squandered funds on personal pleasures—including a diamond ring for his courtesan. He was eventually replaced, and the work continued. As months and years passed, expenses piled up: for lodging, supplies and slaves. Slavery was a way of life in the Americas: The scientists used slaves to carry heavy surveying equipment, such as iron quadrants, up mountain paths too difficult for mules.

Many resident colonials, not understanding the mission or even what science was, took the foreigners for smugglers. In the South America of that time, all smugglers were believed to be Jews, and since practicing Judaism was punishable by death, the local head of the Inquisition took great interest in the travelers. They shook him off the trail by inviting him for dinner and telling him: “We would serve only pork, with all its sauces.”

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After nine long years of measuring the ground and the stars, the scientists finally triumphed in 1743. They now possessed the magic number: 68.70 miles (using our own units) for one degree of latitude on the equator, as compared with 69.07 miles in Paris. It was time to return home and present their findings. But the War of the Austrian Succession had drawn England and Spain into vicious naval hostilities, making ocean travel perilous. So the men dispersed, each to find his own way home.

The first scientist to arrive in Paris, Pierre Bouguer, received from the academy the accolades that were the entire team's due. Another, Charles Marie de La Condamine, who had rafted down dangerous rapids and negotiated the uncharted Amazon before crossing the Atlantic, returned a little later and made his name by publishing his adventures in 1751.

But one man, the team's doctor, Joseph de Jussieu, didn't have the heart to leave behind the many people he had come across on his way, in particular those working at a silver mine that used mercury in separating ore, who needed his medical attention. He finally returned to France 36 years after the group's departure. Another member of the expedition, Jean-Baptiste Godin des Odonais, took even longer to return home. Married to a local woman, Isabel, he refused to leave her behind after they had become separated and Portuguese authorities barred his re-entry through their territory to pick her up. The couple waited for each other for 21 years in the Amazon, Isabel dozens of miles upstream from Jean-Baptiste. They finally made it to France together in 1773.

The Geodesic Mission remains one of the greatest adventures in history, even if the science at its core seems of only passing interest today. Mr. Ferreiro's superb book makes every mosquito bite, pork dinner and sleepless night seem worth it.

*Mr. Aczel's "A Strange Wilderness: The Lives of the Great Mathematicians" will be published in October.*

## REVIEW &amp; OUTLOOK

## Money-Market M

**A**mid the Greek mini-panic this month, did you notice the really shocking news? To wit, U.S. regulators are worried about the "systemic risk" posed by the exposure of American money-market funds to European bank debt.

That's right, nearly three years after the panic of 2008, our all-seeing regulators have somehow not fixed what was arguably the single biggest justification for government intervention at the time. In 2008, the feds felt obliged to guarantee all money-fund assets after they let the Reserve Primary fund pile into bad Lehman Brothers paper, Reserve broke the \$1 net-asset value, and in the following days some \$400 billion fled prime money funds. We'd have thought our regulatory wise men would have fixed this systemic risk before all others.

Yet now we learn that since 2008 U.S. money funds have been allowed to pile into European bank debt even as everyone knew those banks had stocked up on bad European sovereign paper. The Treasury is even saying privately that the U.S. needs to support the European bailout of Greece lest European banks fail, U.S. funds take big losses, and we get another flight from money funds.

Can this possibly be happening?

Yes, and this time it's an entire industry as opposed to a particular fund. Half the assets in U.S. prime money market funds were invested in European banks as of the end of May, according to Fitch Ratings. Apparently, our regulators were too busy writing 2,300 pages of Dodd-Frank law and thousands of new rules to notice the systemic risk that is right before their eyes.

The flight from money funds in 2008, and potentially now, highlights a key vulnerability of the financial system: Money funds are perceived as akin to bank savings accounts because they seem to be all but guaranteed against loss, even though they aren't. Even worse, they employ a creative accounting technique that rewards the first customers to head for the exits.

This investor conditioning is courtesy of a 1983 Securities and Exchange Commission rule that allows money funds to report a stable net-asset value of \$1 per share, even if that's not precisely true based on changes in the fund's underlying assets. The result is that investors have come to expect that money funds never "break the buck," never decline in value. It also means that if big institutions notice that a fund's underlying assets start to decline, they have a strong incentive to get out quickly while their 99-cent investment is still officially valued at \$1.

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## Spending His Way

**P**resident Obama enters the debt-ceiling talks today when he meets with members of both parties, and in his Saturday weekly radio address he unveiled a new line of argument against significant spending cuts: "We can't simply cut our way to prosperity."

That's a nifty rhetorical riff, a play off the old Ronald Reagan line that we can't tax our way to prosperity. The argument is that if we cut too much spending on too many good things—like education, "clean energy" and "advanced manufacturing," to name three examples highlighted by the President—the economy will suffer.

Too bad it won't fly. It's a truism that budget cuts alone will not guarantee faster economic growth, but at the current moment they will get us closer to it. With spending at 24% and debt held by the public at 70% of GDP—both modern records—the U.S. needs drastic

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**T**he Obama Administration leaked word last Thursday that Moammar Gadhafi is "seriously considering" quitting Tripoli, though how we know that without being able to kill him is a mystery. But that ostentatious leak was about all the White House did to persuade House Members to support the Libyan mission. The Colonel—fleeing, about to flee, or not—will take comfort from the political spectacle that ensued.

In one vote Friday, the House rejected a resolution, 123 to 295, that would have approved the campaign against Gadhafi. Some 70 Democrats joined the vast majority of the GOP caucus—225—to defeat the resolution, which mirrors a Senate measure sponsored by John McCain and John Kerry. Another Republican-led vote, which would have cut off funds for all military operations aside from support services like intelligence, surveillance, or search and rescue, also went down 238 to 180.

The White House didn't even bother to put out a statement claiming victory, and little wonder. Thirty-six Democrats and 144 Republicans voted for the defunding bill, and it would have passed had not 89 Republicans bucked their own party. Bravo to most of those 89, who didn't change their war principles because a Democrat is in the White House. The exception were those who voted no because they said the funding cut-off didn't go far enough.

Speaker John Boehner supported the measure though he didn't vote, and second in command Eric Cantor and the rest of the GOP

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